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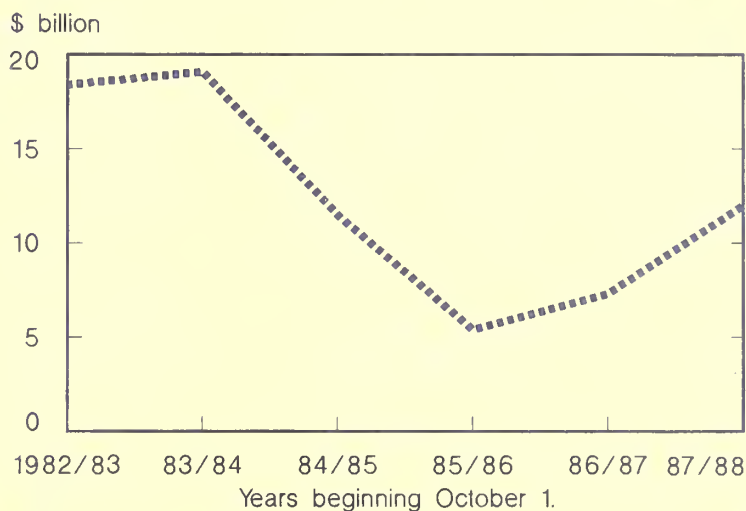
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World Agriculture

Situation and Outlook Report

U.S. Agricultural Trade Balance Turns Up



U.S. agricultural imports remain high, but exports are outpacing them.

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SUMMARY

Economic forecasts have now fully internalized the assumed effects of last October's stock market plunge. The adjusted forecasts generally are less pessimistic than before. The world economy is expected to grow 2.6 percent in 1988, down 0.4 percent from the pre-October forecast. Excluding the United States, world growth is projected at 2.5 percent, also 0.4 percent lower. In both instances, earlier assessments had called for a drop of up to 1.0 percent from pre-October estimates.

While the U.S. and Japanese economies may grow about 3 percent in 1988, other industrialized countries are expected to grow at about a half a percent less. Increased exports will lead economic growth in the United States, while in Japan, growth will be fueled by government-inspired moves to bolster domestic demand, which exceeded 7 percent (on an annual basis) in third-quarter 1987. Canada is likely to have reduced consumer spending, largely due to lower stock prices, with real economic growth of about 2.2 percent.

Growth in the European Community (EC) is forecast at 2.0 percent in 1988. The West German economy, which accounts for more than 25 percent of the EC's economic activity, is expected to grow at just 1.7 percent, in spite of a recent cut in the discount rate (now 2.5 percent) and tax cuts of DM20 billion (\$12 billion). The main reason is an expected loss of DM12.6 billion (\$7.50 billion) in net exports, or approximately 1.0 percent of West German GDP.

Overall Asian growth in 1988, forecast at 5.4 percent, is expected to be little affected by equity price movements. But the Newly Industrialized Countries (NIC's) could be substantially affected. With exports equaling roughly 70 percent of real GDP and 35 percent of exports going to the United States, the NIC's are particularly vulnerable to an economic slowdown among industrial countries. Therefore, real growth in the NIC's is forecast at 6.5 percent, down 0.7 percent from pre-October estimates.

In spite of coordinated central bank intervention over the yearend holidays, *the dollar reached new lows* against major foreign currencies in the opening days of the new year. However, during January and February

the dollar slowly regained approximately half the loss sustained during its October-December fall. Two consecutive improvements in the monthly U.S. trade deficit announced in those 2 months probably helped.

On December 22, the countries involved in the Louvre accord reaffirmed that the accord was still in effect. In February 1987 the G-7 countries of Canada, France, West Germany, Italy, Japan, the United Kingdom, and the United States had pledged to support the dollar against major currencies at "around current levels." The December announcement noted that further dollar depreciation would be counterproductive for world economic growth, but offered no additional policy measures, and made no attempt to account for the difference that had occurred in "current" exchange rate levels since the October stock market plunge.

U.S. agricultural exports are forecast to grow at least 10 percent in fiscal 1988 as the United States gains a larger share of growing world markets. Exports are expected to rise \$4.6 billion and 13 million tons to \$32.5 billion and 142.5 million metric tons. Stepped-up use of the Export Enhancement Program is an important factor behind increased U.S. competitiveness, and will probably boost the share of agricultural exports involving U.S. Government assistance this year.

The forecast for U.S. agricultural imports, at \$20.5 billion, shows little change from the last 2 years. With the higher export forecast, the U.S. agricultural trade balance is projected to rise \$4.7 billion from last year to \$12 billion. This will be the second year in a row the surplus has widened.

On February 13, the 12 members of the European Community adopted a *reform package* that provides a major infusion of revenue for the Community, while limiting future growth in expenditures under the Common Agricultural Policy. The agreement initiates measures to limit future price support and other budget costs for many commodity sectors and provides for land set-aside programs. The reforms will bear on the outcome of the Uruguay round of multilateral trade negotiations under the General Agreement on Tariffs and Trade.

Global Assessment

Economic forecasts have now fully internalized the assumed effects of last October's worldwide plunge in equity prices. For the most part, the adjusted forecasts are less pessimistic than before. Overall, the world economy is expected to grow 2.6 percent in 1988, down 0.4 percent from the pre-October forecast. Excluding the United States, 1988 world growth is projected at 2.5 percent, also 0.4 percent below the pre-October forecast. In both instances, initial forecasts had been for a drop of up to 1.0 percent from pre-October estimates.

The events in the world's stock markets have not yet resulted in dramatically slower U.S. consumption or significantly lower-than-expected investment spending in other developed countries. The longer the wait, the more likely it is that last October's events will become nothing more than an economic shrug. Moreover, any economic effects of the crash could well be indistinguishable from an already old business cycle running out of steam.

It appears that the imbalances in the world economy will take some time to resolve. Some progress has been made in reducing the U.S. budget and trade deficits, bolstering domestic demand in Japan and West Germany, and easing the debt problem in the developing countries (LDC's), particularly in dealing with immediate crises. But the likeliest outcome is that 1988 will be the fifth straight year of essentially slowing growth for many developed and developing countries and regions.

Inflationary expectations don't appear to have been affected by the stock market. A significant upturn in world inflation is expected in 1988, a large portion of which will emanate from Latin America. World inflation is seen as rising nearly by half, reaching 18.0 percent in 1988. Broken out, this figure is composed of developed-country inflation of 3.3 percent, and LDC inflation of near 90 percent (Latin American inflation is projected at 231 percent, up almost 100 percentage points from a year earlier).

With real growth of 2.5 percent in 1988, the developed country economies can, at best, be described as sluggish. While the U.S. and Japanese economies may grow about 3 percent in 1988, other industrialized countries are expected to grow at about a half a percent less. Increased exports will lead economic growth in the United States, while in Japan, growth will be fueled by government-inspired moves to bolster domestic demand, which exceeded 7 percent (on an annual basis) in third-quarter 1987. Canada is expected to have lower consumer spending in 1988 (largely due to lower stock prices), with real economic growth of about 2.2 percent.

The European Community (EC) is forecast to have 2.0-percent growth in 1988. The West German economy, which accounts for more than 25 percent of the EC's economic activity, is expected to grow at just 1.7 percent. This is in spite of the recently-adopted cut in the discount rate (now 2.5 percent) and tax cuts of DM20 billion (\$12 billion) distributed over 1986, 1988, and 1990. The main reason is an expected loss of DM12.6 billion (\$7.5 billion) in net exports, or approximately 1.0 percent of West German GDP.

LDC Growth: Only the Smallest Bit of Good News

The best (and possibly the only) good news the LDC's may get from the stock market crash is a 60-basis-point decline in the London Interbank Offer interest rate. Such a decline would save LDC's around \$7.0 billion on their interest payments. Balanced against this is the slowdown in world growth, suggesting that commodity prices are unlikely to rally significantly and that world export growth could very well slow. The volume of world exports, which rose an estimated 4.5 percent in 1987, is expected to grow at only 3.5 percent in 1988. Also, debt and inflation problems continue to dampen investment in particular and growth in general.

While 1988 LDC growth is expected to be just 0.2 percent below the 2.6-percent pace set in 1987, the rate is well below the pre-October forecast of 3.5 percent. The main part of this adjustment comes from Latin America, particularly Mexico and Brazil.

Pre-October estimates for Latin American growth were 2.2 percent higher than the currently projected 0.8 percent. The economies of both Brazil and Mexico are expected to contract slightly in 1988, whereas previous forecasts showed 1988 growth of around 3.0 percent. For the most part, the adjustment in both countries has little to do with stock market problems. Rather, Brazil and Mexico are faced with the possibility of severe inflation and the collapse of investment.

Asia and the NIC's. Overall Asian growth in 1988 is expected to be little affected by equity price movements. Growth is forecast at 5.4 percent. But growth in the Newly Industrialized Countries (NIC's) could be substantially affected. With exports equaling roughly 70 percent of real GDP (35 percent going to the United States), the NIC's are particularly vulnerable to an economic slowdown among the industrial countries. As a result, under the post-October scenario, real growth in the NIC's has been adjusted downward by 0.7 percent to 6.5 percent.

Commodity Prices: Light At the End of The Tunnel?

In 1987, non-oil commodity prices in U.S. dollar terms rose 30.8 percent on a December-to-December basis, while on an annual average basis they were up 8.6 percent (see table). This indicates commodity prices may have reached a nadir. However, much of the rise reflected the depreciation of the dollar, and in Special Drawing Rights terms the average price declined 1.8 percent. In real terms (i.e. deflated by unit values of manufactured exports) commodity prices fell 3.8 percent in 1987. In fact, real commodity

prices remain at levels that until now had not been seen since the early 1930's.

In 1988 commodity prices are expected to rise both in nominal and real terms. But the rise in real terms is unlikely to exceed 2 percent. Given the current low level of commodity prices, the rise will not particularly benefit the LDC's, whose export earnings declined almost 25 percent between 1980 and 1986. If the slowdown in world growth proves more severe than currently expected, commodity prices will be discounted below what is now expected. To some extent this scenario is already incorporated in the outlook, with end-of-year-1987 to end-of-year-1988 numbers showing a decline.

Oil prices slide. During the last 3 months, oil prices have declined. As of March 1, world oil prices averaged about \$16 a barrel, down almost \$4 from last year's peak. All indications are for still lower prices, with some analysts estimating that prices will remain in the \$13 to \$17 range for perhaps the next 2 years. Due mainly to overproduction in Iraq, OPEC has at times been 2.0 million barrels a day above quota. The excess oil supply is likely to continue, with analysts estimating that first-quarter 1988 consumption could be 0.5 million barrels a day below production. Such downward pressure on prices does wonders for inflationary expectations, but is the harbinger of bad times for oil-exporting countries' growth.

LDC Debt: No Improvement

The World Bank's annual report on world debt documents the fact that the LDC debt crisis remains unresolved. Despite prolonged

Non-fuel commodity and manufactures export prices

	1981	1982	1983	1984	1985	1986	1987
1980=100, U.S. dollar terms							
Non-fuel commodity prices:							
All countries	89.9	80.6	85.6	87.5	76.0	73.1	79.4
Developing countries	86.5	77.9	83.3	86.7	75.5	74.7	77.2
Developed countries	92.7	82.7	87.6	88.1	76.4	71.8	81.4
Manufactures export prices:							
Developing countries	106.0	100.2	90.4	89.2	85.3	85.4 ^e	92.2 ^e
Developed countries	96.1	92.7	89.8	87.5	87.2	99.3	111.6 ^e

e = Estimate.

Source: IMF, IMF Survey and International Financial Statistics, various issues.

expansion in the industrialized economies, the situation in the debtor countries arguably has grown worse. The report indicates that LDC debt has expanded by just 2.0 percent in the last year, to \$1.2 trillion. This small movement, essentially coming from refinancing packages for Argentina, Mexico, and Korea, indicates the continued lack of credit-worthiness on the part of the LDC's.

Investment and the opportunities for economic improvement in the LDC's are being severely restrained, as exemplified by the Bank's calculation that real per capita income in the highly indebted middle-income countries actually fell by one-seventh during the 1980's. The report also indicates that in the indebted LDC's, income, consumption, and investment are generally at 1970's levels. Africa is in even worse shape, with these factors at 1960's levels. Further, the report estimates that there was a net capital outflow of \$29 billion from these countries in 1987, second only to the 1986 outflow of \$30.7 billion. [Tim Baxter (202) 786-1790]

Dollar Exchange Rates

After reaching new lows against major foreign currencies in the opening days of the

World and regional economic growth

Calendar year	1984	1985	1986	1987	1988
	Percent change				
World	4.1	3.0	2.8	2.8	2.6
United States	6.6	3.0	2.9	2.9	2.8
World less U.S.	3.2	3.0	2.8	2.6	2.5
Developed countries	4.5	3.1	2.6	2.7	2.5
Less U.S.	3.4	3.3	2.4	2.6	2.3
EC-12	2.3	2.4	2.4	2.3	2.0
Japan	5.1	4.7	2.5	3.5	3.2
Developing countries	3.1	2.5	2.6	2.6	2.4
Oil exporters	1.3	-0.1	-2.1	0.1	1.0
Non-oil exporters	4.4	4.2	5.8	4.3	3.4
Latin America	3.3	3.6	3.7	2.3	0.8
Africa and Middle East	1.1	0	-1.2	0.1	1.7
Asia	5.4	4.0	5.8	5.9	5.4
NIC's	8.9	3.7	9.9	11.3	6.5
Centrally planned economies	3.7	2.9	3.9	3.5	3.3

Sources: IMF, The WEFA Group Inc., ERS.

new year, in spite of coordinated central bank intervention over the yearend holidays, the dollar slowly regained in January and February approximately half the loss sustained during its fall from October through December. Two consecutive improvements in the monthly U.S. trade deficit announced in those 2 months probably helped a lot.

While there seemed to be little direct linkage between changes on currency markets and the October plunge in world equity markets, investor reaction to policies in the aftermath did lead to dollar declines against most major currencies. The early November announcement that the United States would gear its interest rates toward sustaining U.S. economic expansion rather than toward defending the dollar pushed the dollar lower because of narrowing U.S.-foreign interest rate differentials. While the mid-November release of better-than-expected U.S. trade figures led to a brief respite in the dollar's decline, the difficulty of negotiations between the Congress and the Administration on U.S. budget deficit reductions during December weakened the dollar further.

On December 22, the countries involved in the Louvre accord reaffirmed that the accord was still in effect. The accord was reached in February 1987 among a number of the major industrial countries (the G-7 countries of Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States) to support the dollar against major currencies at "around current levels." The December announcement noted that further dollar depreciation would be counterproductive for world economic growth, but offered no additional policy measures, and made no attempt to account for the difference that had occurred in "current" exchange rate levels since the October stock market plunge.

Without new measures, market skepticism about the accord's viability remained a factor. While central bank intervention or monetary policy changes--covered under the Louvre accord--can provide short-term support for the dollar, these measures do not have a lasting impact such as changes in fiscal programs might provide. Thus, the accord was designed as a temporary measure while fiscal measures were devised to help adjust the large trade imbalances between the United States and its trading partners. Although these fiscal

measures take longer to enact, once successfully implemented, they would help sustain the dollar without central bank intervention on foreign exchange or monetary markets.

Consequently, currency traders may have largely disregarded West Germany's monetary stimulus from a discount rate reduction from 3 to 2.5 percent—coordinated with similar reductions in Austria, Belgium, France, the Netherlands, and the United Kingdom on December 3—as less likely to adjust the trade imbalances than appropriate fiscal measures. The U.S. budget deficit reduction package in December, planned and unplanned increases in Japanese and German fiscal stimulus, and first-quarter progress in the U.S. monthly trade deficit probably account for the strengthening of the dollar since the end of December.

While currency traders considered the December U.S. budget deficit reductions of \$76 billion over fiscal 1988 and 1989 as rather minimal, additional fiscal adjustments abroad have come about recently. Japanese growth during third-quarter 1987 reached an annual rate of 8.4 percent, driven almost entirely by domestic demand rather than by the export demand which has so expanded Japanese trade surpluses. Moreover, the new Japanese budget to take effect in April 1988 is to incorporate stimulative measures to help continue this strong growth.

The increased West German fiscal stimulus has come about in the face of their strong resistance to additional spending. Bonn recently announced that its 1988 budget deficit would reach DM40 billion, compared with the DM30 billion originally proposed. Nevertheless, the large trade imbalances between the United States and its trading partners are not likely to be adjusted quickly enough to prevent further declines in the dollar during 1988, despite the belief of Louvre accord participants that a further dollar drop would be counterproductive. [Ted Wilson (202) 786-1791]

WORLD TRADE AND AGRICULTURAL POLICY

U.S. Agricultural Trade

U.S. agricultural exports are forecast to grow at least 10 percent in fiscal 1988 as the

United States gains a larger share of growing world markets. Exports are expected to rise \$4.6 billion and 13 million tons because of increased U.S. competitiveness and the ability of the United States to meet world demand as competitors' supplies shrink. At \$32.5 billion and 142.5 million metric tons, U.S. agricultural exports will be the largest since fiscal 1984.

The forecast for U.S. agricultural imports, \$20.5 billion, shows little change from the last 2 years. Expected increases in imports of animals and horticultural products will offset a decline in the value of coffee imports. Therefore, the U.S. agricultural trade balance, up \$4.7 billion from last year to \$12 billion, will improve for the second year in a row.

Most of the expected improvement in exports is in grains, where the United States suffered the largest loss of shipments and market share during the first half of the 1980's. Since fiscal 1986, world trade in grains has grown nearly 20 million tons, to an expected 221 million tons in 1987/88. During this same period, U.S. grain exports shot up 30 million tons as foreign consumption once again began overtaking production. For example, growing consumption cut China's net exports of coarse grains by 4.2 million tons. Earlier, China had become a major factor in coarse grains markets, increasing its exports tenfold in a single year.

Other exporting countries saw exportable supplies drop during the last 2 years because of poor weather and policy changes. In particular, coarse grain supplies dropped in Argentina, Thailand, and South Africa. U.S. wheat exports in 1988 are also benefiting from weather-induced declines in crop quality in the European Community (EC) and the USSR. Soviet purchases of U.S. milling-quality wheat reached 6.9 million tons midway through fiscal 1988, compared with 4.1 million tons for all of fiscal 1987. Sales to China were 2.2 million tons higher. Both China and the Soviet Union have purchased U.S. wheat solely through the Export Enhancement Program (EEP) during fiscal 1987 and 1988.

Increased use of the EEP is an important factor behind increased U.S. competitiveness, and will probably boost the share of agricultural exports involving U.S.

Government assistance this year. Close to one-fifth of all U.S. agricultural exports, in value terms, now involve either EEP, food aid, credit guarantees, or other U.S. Government programs. This is a much greater proportion than during the late 1970's and early 1980's, but is still below peak levels reached in the 1950's and 1960's. In 1988, the EEP will boost exports of soybean oil and barley exports as well as wheat.

Another factor behind improved U.S. competitiveness is the dollar's depreciation on foreign exchange markets. Between early 1985 and 1988, the dollar declined about 50 percent against the German mark and the Japanese yen. While grain sales to these and other strong-currency countries have not shown a corresponding improvement, sales of high-value products grew 12 percent in fiscal 1987. Further growth is expected in fiscal 1988 as horticultural exports increase \$350 million and livestock and product exports remain near 1987's record \$5 billion.

As world consumption outpaces production of major export commodities, stocks have begun to decline and prices to rise, further boosting the value of U.S. exports. Most exporters carry over minimal

stocks from one crop year to the next. Such has not been the case in the United States. During the mid-1980's, the United States accounted for nearly 80 percent of the world's increase in ending stocks of grain. Now, the United States is expected to account for the most of this year's decline in these stockpiles. [Stephen A. MacDonald (202) 786-1822]

EC Agrees on Reform Package

On February 13, heads of state of the 12 members of the European Community (EC) adopted a reform package that provides a major infusion of revenue for the Community's coffers. The agreement also limits future growth in Common Agricultural Policy (CAP) expenditures.

The agreement initiates measures to limit future price support and other budget costs for a wide range of commodities and provides for land set-aside programs. The reforms will bear on the outcome of the Uruguay round of multilateral trade negotiations under the General Agreement on Tariffs and Trade (GATT).

International commodity prices

Year	Wheat				Corn		Soybeans	Soyoil	Soymeal 44%	
	U.S. 1/	Arg. 2/	Can. 3/	Aust. 4/	U.S. 5/	Arg. 2/	U.S. 5/	U.S. 6/	U.S. 6/	Ham. 7/
Dollars per metric ton										
1980	176	203	192	175	129	159	272	522	217	271
1981	176	190	194	175	135	139	272	464	223	269
1982	161	166	165	160	110	109	233	404	197	233
1983	158	138	167	161	137	133	269	518	222	255
1984	153	135	166	153	138	132	271	678	184	210
1985	137	106	173	141	114	103	214	596	140	171
1986	117	88	161	120	89	83	200	361	174	197
1987	114	89	134	115	77	80	204	349	194	215
Jan.	110	82	136	110	70	66	188	341	163	197
Feb.	114	92	138	112	69	66	187	335	169	197
Mar.	116	90	139	115	73	70	189	331	162	194
Apr.	115	88	134	115	76	73	195	331	175	203
May	120	88	136	119	82	82	210	351	194	210
June	110	86	130	111	82	83	214	343	206	224
July	106	84	126	107	77	90	211	332	198	210
Aug.	108	84	124	109	72	88	202	329	186	204
Sept.	114	89	130	115	74	84	203	336	197	214
Oct.	116	95	134	118	80	84	204	370	205	223
Nov.	116	95	134	118	83	84	216	378	231	246
Dec.	126	95	142	126	84	86	226	414	236	257

1/ No. 2 hard winter, ordinary protein, f.o.b. Gulf ports. 2/ F.o.b. Buenos Aires. 3/ No. 1 western red spring, 13.5% protein, in store Thunder Bay. 4/ July-June crop year, standard white, f.o.b. selling price. 5/ U.S. No. 3 yellow, f.o.b. Gulf ports. 6/ Decatur. 7/ Hamburg, f.o.b. ex-mill.

EC outlays for price and income support in agriculture have grown from \$15.7 billion in 1985 to a projected \$33.5 billion in 1988. During that time, the share of the budget devoted to grains and oilseeds (excluding olive oil) has grown from 17 percent to an estimated 29. The costs of depreciating grain held in public storage to reflect lower world prices, outlays for structural adjustment, and national agricultural support outlays are not included in these figures.

With outlays for agricultural support growing faster than revenues available to pay for them, the EC member nations faced something of a dilemma. The Treaty of Rome that set up the Common Market in 1957 requires a balanced budget. Over the years, EC heads of state have agreed at regular intervals to increase the revenue needed to cover expenses. With the depreciation of the dollar, lower commodity prices, sharp increases in support cost for oilseeds, and enlargement of the EC to include Spain and Portugal in 1986, the budgetary pressure has continued to grow. Accounting procedures such as delay of reimbursements to national governments past yearend and failure to depreciate stocks to reflect their sales value merely postponed the day of reckoning.

In December 1987, EC heads of state met in Copenhagen but failed to agree on a solution to the budget crisis from either the outlay or the revenue side. The Commission had proposed a program of stabilizers aimed at limiting the growth of outlays in support of the CAP by cutting support prices automatically when forecast production exceeded certain thresholds. However, no agreement was reached, and the Community began 1988 without a budget. Members continued to contribute to CAP financing on a continuing resolution basis at 1987 levels (called "provisional twelfths" in the EC).

When EC heads of state met again in Brussels on February 11-12, many observers expected continued deadlock. The United Kingdom refused to agree to additional funding without some effort to limit the growth of the agricultural budget. But other countries, led by West Germany, did not want to hurt farm income, especially in a year with important elections in both West Germany and France. In the end, a compromise was reached that established the mechanisms for limiting

expenditure growth, that increased and shifted the basis for national contributions to the EC budget, and that maintained the U.K.'s rebate as part of its contribution to EC financing.

The package agreed to affects both EC resources and outlays. On the revenue side, the basis for national contributions is shifted from the value-added tax base to national GNP. Thus, once member nation parliaments ratify the new funding agreements, about 25 percent more money will be available to pay for EC programs, of which the CAP makes up about 70 percent.

On the outlay side, 1988 spending on the so-called "guarantee" (or price support) portion of the CAP was limited to \$33.5 billion (27.5 billion European Currency Units, or ECU), with future annual growth limited to 74 percent of the rate of growth of GNP. Structural support measures and costs of depreciating public stocks remain outside this guideline, as does part of the cost of the new set-aside program. Additionally, in the event of certain unexpected developments, such as exchange rate shocks, these limits may be revised.

For grains, the heads of state set up a limited system of automatic price stabilizers, requiring that support prices be reduced in the following season by up to 3 percent if production exceeds a maximum guarantee quantity of 160 million tons. For oilseeds, support prices are to be reduced in the same year that production is forecast to exceed the maximum guarantee quantity. A program of paid land set-asides, jointly paid for by the EC and member governments, was provided for, plus a new producer coresponsibility levy (tax), in addition to the one already in place. Actual rules for implementation of these programs have not yet been released.

While the new basis for funding the CAP must still be ratified by national parliaments, a provisional procedure has been proposed, and EC finance ministers sent a draft 1988 budget to the European Parliament on March 7. All told, the budget calls for total commitments of almost \$38 billion for agriculture, including \$33.5 billion for price and income supports. The total proposed EC budget is almost \$55 billion. [Mark D. Newman (202) 786-1616]

RESEARCH AND DEVELOPMENT AFFECTS U.S. AND THIRD WORLD SOYBEAN TRADE

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Abstract: A historical view shows that U.S. dominance of world soybean trade, founded on U.S. research and development in the 1940's and 1950's, declined in the 1980's as the South American countries, spurred by high prices, developed large-scale production and processing facilities. Their success, mainly in temperate areas, has not been duplicated in tropical areas elsewhere in the Third World. In most Third World countries, economic development and rising incomes have raised the use of soybean products above local production, with the result that imports are increasing.

Keywords: Soybeans, agricultural research, production, processing, trade, United States, Brazil, Argentina, Third World.

Soybean production was dominated by China in the 1940's when U.S. plant breeders set to work to redesign the soybean plant to make it suitable for mechanized harvesting and U.S. growing conditions. U.S. investment in efficient technology for extracting oil from the soybean seed and processing to prevent the oil from developing undesirable off-flavors made it a useful and low-cost edible oil. U.S. research in livestock and poultry feeding using soybean meal combined with rising demand for meat and poultry products to create large markets for soybean meal in the United States and overseas, especially in Western Europe and Japan. U.S. production and exports dominated these markets.

During the early 1970's, high soybean prices encouraged first Brazil and then Argentina to greatly expand large-scale soybean production and processing for export. As these countries offered lower prices to buyers, the United States had to begin sharing its markets with them in the 1980's.

The United States soybean sector has also had to compete with palm oil from Malaysia and Indonesia. The low production costs of new, high-yielding varieties that doubled yields have made the Asian palm oil industry very profitable. In Malaysia, there was a large switch in the private sector to oil palm cultivation on land which had previously been used for rubber. In Indonesia, the main development of oil palm has been on publicly-owned lands.

These two countries have replaced Africa as the main supplier of palm oil. This expansion of palm oil in Southeast Asia was assisted by loans from international lending institutions such as the World Bank. Malaysia

Table 1--World soybean production, 1983-85 average

Group and country	Production	Harvested area		Yield
		1,000 tons	1,000 ha	
Developing countries:	25,986	15,518	1.67	
Brazil	16,190	9,237	1.75	
Argentina	5,983	2,820	2.10	
Indonesia	707	778	0.90	
India	687	950	0.71	
Paraguay	673	440	1.51	
Mexico	567	350	1.62	
Republic of Korea	238	185	1.28	
Thailand	179	162	1.08	
Egypt	157	58	2.76	
Colombia	107	55	1.93	
Iran	102	54	1.90	
Zimbabwe	85	54	1.62	
Bolivia	71	45	1.59	
Nigeria	58	190	0.31	
Turkey	47	25	1.85	
South Africa	31	29	1.10	
Ecuador	29	17	1.60	
Burma	21	29	0.74	
Uruguay	14	10	1.36	
Taiwan	10	6	1.63	
Zambia	10	8	1.27	
Philippines	8	8	0.96	
Guatemala	5	3	1.60	
Peru	2	1	2.00	
Pakistan	2	3	0.58	
Developed countries:	52,832	27,334	1.93	
United States	51,591	26,720	1.93	
Centrally planned economies:	10,700	9,065	1.18	
China	9,495	7,757	1.70	

Source: (12).

now supplies over three-quarters of world palm oil exports. Indonesia supplies 15 percent of the market.

Still more competition for U.S. soybeans is now arising in the European Community (EC), which has been using high price supports since the mid-seventies to encourage its farmers to grow more rapeseed, sunflowers, and soybeans. Production of rapeseed and sunflowers, two oilseeds especially well suited to the climate of Western Europe, is increasing. The competition among the United States, Brazil, and Argentina may become even more fierce if the EC continues to follow present policies and is able to reduce its imports substantially.

This international trade competition is prompting U.S. soybean producers and processors to search for new markets, including countries of the Third World. Economic development and population growth in the Third World are raising the demand for edible oils and for protein supplements for feeding livestock and poultry. To gain a large share of these growth markets the United States will have to be price competitive.

U.S. Research and Development Created A World Market for U.S. Soybeans

Early this century, Manchuria, a province of China, was the principal exporter of soybeans to the world and the United States. The beans imported into the United States were processed into oil and meal with hydraulic pressing. U.S. farmers did grow some soybeans, but mostly for hay and green manure, not seed for processing.

Growing soybeans for processing expanded in the United States after the introduction of efficient solvent extraction technology from Germany in the 1930's. The solvent extraction process removes almost all the oil, leaving 1 percent or less of residual oil in the meal. Early oil extraction by pressing produced oil and press cake containing 3.5 percent or more of residual oil. With the improved technology, a soybean seed processing industry developed and a market was created for soybeans grown for seed. By 1941, the area of soybeans grown for processing into oil and meal exceeded that for hay and green manure.

Soybean planted area expanded rapidly in the United States during the 1940's and 1950's as breeders developed new varieties. The

Table 2--Net imports by developing countries 1/

Country	Soybeans	Soybean --	
		meal	oil
1,000 tons			
Mexico	1,314	103	47
Republic of Korea	739	189	0
Israel	443	-5	14
Malaysia	169	145	-13
Venezuela	107	576	85
Saudi Arabia	31	110	6
Hong Kong	18	98	2
Iran	17	315	353
Singapore	13	83	8
South Africa	4	159	11
Iraq	3	167	1
Chile	0	31	87
Algeria	0	162	10
Higher-income countries	2,871	2,376	664
Taiwan	1,366	-3	2
Indonesia	374	169	5
Colombia	107	10	68
Egypt	49	222	45
Turkey	29	2	93
Philippines	18	273	4
Morocco	15	2	126
India	0	-275	581
Pakistan	0	6	260
Thailand	-1	218	27
Paraguay	-562	-49	0
Lower-income countries	1,617	764	1,706
Argentina	-2,475	-2,343	-447
Brazil	-1,912	-8,103	-836
Developing countries	101	-7,004	126

1/ The countries listed had net imports greater than 75,000 tons. The subtotals for higher- and lower-income countries are greater than the countries shown because the countries with less than 75,000 were included in the summation.

Source: (12).

varieties made available before the 1940's were Asian. In particular, the varieties grown in Manchuria had a suitable daylength for the Midwest. After the 1940's, soybean breeders began crossing these introductions from Asia to create new, improved varieties that were more disease-resistant and did not shatter as easily when harvested mechanically. It was only through the development of new varieties that soybean production could become widespread in the lower Mississippi Valley and the southeastern United States (5). 1/

1/ Numbers in parentheses refer to References at end.

Reduced shattering during harvesting was important for mechanized U.S. farmers. Asian farmers had developed varieties that shattered easily because they cut the plant by hand just before maturity and carried it to the village for drying. Varieties that shattered easily during manual threshing were desirable. However, this trait resulted in high field losses for U.S. farmers who let their crop mature and dry in the field before harvesting with machines.

Despite varietal improvements, soybeans remained a relatively minor crop until U.S. consumers experienced shortages of butter during World War II. Once soybean oil started going into the manufacture of margarine, U.S. soybean production doubled.

Soybean oil.—Although partially refined soybean oil became an important edible oil in the United States in the late 1940's in shortenings and margarines, when it was refined further to meet the more stringent requirements for salad oil uses, problems arose. Unlike some competing oils, highly-refined soybean oil developed an unacceptable beany flavor shortly after processing.

The flavor of an edible oil is influenced by its fatty acid composition. The fatty acid composition of soybean oil is approximately 10 percent linolenic, 30 percent oleic, and 55 percent linoleic acid. When linolenic acid is broken down by enzymes or by spontaneous oxidation, a beany flavor develops. Researchers discovered how to convert linolenic to linoleic or oleic acid (hydrogenation). Using this process to reduce linolenic content to less than 2 percent solved the flavor problem, and soybean oil use expanded quickly in the United States and elsewhere.

The 1950's shift in consumer preference to unsaturated fats and oils further increased the demand for soybean oil. This increased processing of soybeans for oil greatly expanded the supply of soybean meal for the livestock industry.

Soybean meal.—Soybean meal use was accelerating by the mid-1950's with the spread of intensive livestock feeding in the United States, Western Europe, and Japan. This increased use of meal was possible

because researchers had discovered how to utilize soybeans as a protein supplement.

Soybean meal has not always been a useful protein supplement. Prior to 1930, animal products, not plant products, were the protein supplements in livestock feeds. Scientific discoveries and new technology changed this. First, researchers learned that heating soybeans would destroy trypsin and other growth inhibitors that are present in raw soybeans. For example, heating the soybeans doubled the efficiency of its meal to promote poultry growth (1).

Soybean meal was then used to substitute for part of the animal proteins in livestock rations. In the late 1940's researchers discovered that it was the vitamin B12 in animal products that made them better protein supplements than soybean meal. With the discovery of how to synthesize B12, livestock and poultry rations with manufactured B12 could be formulated using soybean meal as the primary protein supplement.

The rise of soybean meal to the major protein supplement can be seen in the changes in the typical rations of the U.S. broiler industry. In the 1930's, broiler rations contained no soybean meal (1). By the mid-1940's, typical rations contained 5 percent soybean meal. Now, broiler rations generally contain 30 percent soybean meal.

Table 3--Comparison of relative feeding value of soybean meal

Oilseed meal	Feeding value for--		
	Poultry	Swine	Cattle
	Index 1/		
Soybean meal	100	100	100
Coconut meal	50	50	90-100
Cottonseed meal	85	85	100
Linseed meal	80	80	95
Peanut meal	95	95	100
Rapeseed meal	80	85-90	88
Safflower meal	45-50	45-50	40-45
Sunflower meal	95-100	90-95	95-100

1/ Relative feeding value pound for pound with soybean meal (41 percent protein) used as the base = 100.

Source: (2).

Through the 1960's the United States dominated world soybean trade. This dominance began to decline as soybean production expanded rapidly in South America, first in Brazil and then in Argentina. These countries have focussed on trade in soybean products as multinational companies have established large-scale, modern processing facilities in their countries.

Brazil.—Soybean production began to expand in the 1950's as a substitute for other crops in the established farming areas of southern Brazil. Brazilians were able to use commercial varieties from the southern United States because growing conditions are similar. Production continued to expand in southern Brazil during the 1960's and into the 1970's as farmers began double-cropping soybeans with wheat.

Soybean output continued to increase through the late 1970's and the 1980's as virgin lands in central and west-central Brazil were opened for production. This opening of new lands accelerated with, among other things, the high international prices for soybeans during the first half of the 1970's. Expansion into these subtropical and tropical areas was possible because Brazilian breeders had developed suitable new varieties.

Expanding soybean production along the country's agricultural frontier required huge investments for rural transportation, a problem because of a shortage of capital. This problem was eased during the 1970's with foreign investments (notably from Japan) through Brazil's Export Corridors Program (10). Improved transportation reduced the costs for the inputs needed to grow soybeans and for shipping soybeans for processing and export.

Brazilian exports increased rapidly, especially meal because the Government set export quotas and taxes to favor exports of processed products over soybeans. The Government also provided low-cost financing to build processing facilities (6).

The Brazilian oilseed processing industry, formerly based on small family-owned plants

for cottonseed, peanuts, and castor beans, now includes modern soybean processing facilities. These newer plants process 1,500 tons or more per day, enough to achieve the same economies of size as in the United States. Multinational firms helped transfer this technology to Brazil. By the late 1970's, more than one-third of Brazil's soybean processing capacity was owned by multinational companies (12).

Although the Brazilian soybean sector has grown more slowly in the 1980's than during the previous decade, Brazil remains an important exporter. It has large areas of virgin land and a new program to continue upgrading its internal transportation system (12). Expansion will likely depend on international soybean prices and the availability of capital for rural transportation investments. Currently, international prices are low compared with the boom years of the 1970's, and the country's debt crisis limits the availability of investment capital. Thus, the medium- to long-term prospects for increased soybean output are favorable, but not as good as during the early 1970's.

Argentina.—The rise of soybeans in Argentina from the mid-1970's was just as dramatic as in Brazil. Argentine farmers greatly increased soybean production even though there has been little increase in total grain and oilseed acreage since the 1930's. The greater soybean production resulted from the shift to double-cropping of soybeans with wheat already being grown. As in Brazil, southern U.S. commercial varieties were used because conditions are similar.

Recently, farmers have been dropping wheat and raising just soybeans as a single crop in order to boost soybean yields. The low prices for wheat have reduced its profitability. In 1985/86 and 1986/87, single-crop soybeans were 50 percent or more of the soybean acreage, compared with 30 percent several years before (12). Argentine farmers have also recently been substituting soybeans for corn because of their greater profitability.

Near-term prospects for area increases through substitution for other crops will depend on soybean prices, particularly relative to corn prices. In the longer run, expansion of soybean production into the drier areas of the

Principal Soybean Traders, 1935-39



Arrows, representing trade, are strictly proportional to volume.

Figures in parentheses represent aggregate tonnage in millions of soybeans and soybean products, annual averages.

Source: U.S. Senate, Committee on Agriculture and Forestry, "Foreign Trade in Agricultural Products" (Washington, DC: GPO, 1953).

Principal Soybean Traders, 1950-51



Arrows, representing trade, are strictly proportional to volume.

Figures in parentheses represent aggregate tonnage in millions of soybeans and soybean products, annual averages.

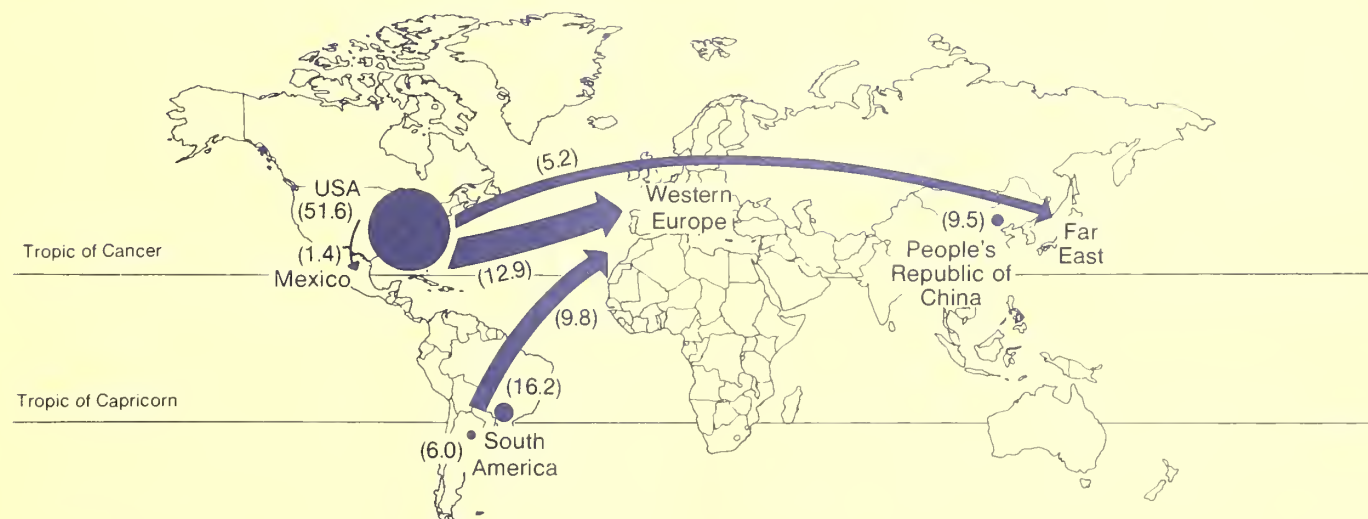
Source: U.S. Senate, Committee on Agriculture and Forestry, "Foreign Trade in Agricultural Products" (Washington, DC: GPO, 1953).

Principal Soybean Producers and Traders, 1962-64



Circles, representing production, and arrows, representing trade, are strictly proportional to volume. Figures in parentheses represent aggregate tonnage in millions of soybeans and soybean products, annual averages. Source: *Oil World*, "The Past 25 Years and the Prospects for the Next 25" (Hamburg 1983).

Principal Soybean Producers and Traders, 1983-85



Circles, representing production, and arrows, representing trade, are strictly proportional to volume. Figures in parentheses represent aggregate tonnage in millions of soybeans and soybean products, annual averages. Source: Unpublished USDA data.

Table 4--Soybean production, area, and yield changes

	1965-67	1983-85	Growth rate	Annual increase	Country share	
					1965-67	1983-85
	---1,000 tons---		Percent	1,000 tons	----Percent----	
Production:						
World	32,470	89,920	5.7	3,192	100.0	100.0
United States	18,092	51,591	5.8	1,861	55.7	57.4
Brazil	611	16,190	18.2	865	1.9	18.0
Argentina	19	5,983	32.1	331	0.1	6.7
	---1,000 ha----		Percent	1,000 ha	----Percent----	
Area:						
World	25,948	52,319	3.9	1,465	100.0	100.0
United States	13,731	26,720	3.7	722	52.9	51.1
Brazil	512	9,237	16.1	485	2.0	17.7
Argentina	16	2,820	28.6	156	0.1	5.4
	---Tons/ha----		Percent	Tons/ha		
Yield:						
World	1.25	1.72	1.8	0.03	--	--
United States	1.32	1.93	2.1	0.03	--	--
Brazil	1.19	1.75	2.1	0.03	--	--
Argentina	1.14	2.12	3.4	0.05	--	--

-- = Not applicable.

Source: (12).

country will be slowed because yields will likely be lower than in the areas where soybeans are now grown.

Soybean processing in Argentina has expanded greatly in recent years because the Government has provided tax incentives to favor domestic processing over the export of soybeans. As in Brazil, the development of processing facilities has been aided by direct foreign investment by multinational grain trading firms, including some based in the United States (12). The six largest companies, all of which are also multinational grain trading firms, control about 45 percent of Argentine processing capacity.

Technology Transfer to Tropics Is Slow

Soybeans moved from East Asia to the United States, and from there to South America because of similar, temperate climates and daylength. Generally, attempts to grow soybeans in tropical areas have been less successful because conditions are quite different.

Soybean production is of interest in tropical countries for several reasons. Soybean products can be used to supplement protein-deficient diets. Soybean production is

also of interest in those countries importing large quantities of soybean or other oils to meet a rising demand for edible oils. A good example is India, the largest importer of edible oils in the world.

In those countries where consumers want more livestock products in their diets, the need for protein supplements raises the demand for soybeans for meal. Thailand is an example of a tropical country attempting to establish a soybean industry to supply its emerging livestock sector with domestically-produced soybean meal instead of imports.

The research effort to develop new varieties and growing practices for the tropics is illustrated by the experience of Brazil. Brazil has developed a soybean research organization with 300 full- and part-time scientists (12). This is a very substantial investment to expand soybean production into their tropics. Few developing countries are wealthy enough to devote so many scientists and the associated facilities and operating budgets to one crop. In comparison, the United States has about 350 people involved in soybean production research.

Suitable soybean varieties can yield well in the tropics under favorable conditions and

with good management practices, as has happened in Brazil. Generally, however, soybeans are grown under less than optimum conditions in the tropics of developing countries. In many cases the inputs, such as fertilizers and seed, are not available to developing-country farmers, and when they are, the price may be too high for input use to be profitable, or credit may not be available for the poorer farmers to afford them. Besides the need for better growing conditions, improved varieties are also needed.

It is difficult to transfer high-yielding U.S. varieties to the tropics because most soybean varieties adapted for U.S. conditions flower too soon to make adequate growth for good yields. Soybeans are very sensitive to daylength and this sensitivity determines the area of adaption of each variety (4).

Another difficulty with transferring U.S. varieties to countries in the tropics is that they are not compatible with the native rhizobia (the essential nitrogen-making bacteria that grow in soybean roots). Introduced varieties must be inoculated with the bacteria with which they are compatible just before planting. This bacterium, *Rhizobium japonicum*, is not widely available in tropical countries because it dies when exposed to high daytime temperatures. Many of the countries in the tropics lack the investment capital to acquire the facilities and equipment to produce, store, and distribute the rhizobia to farmers.

Poor seed germination is also slowing the expansion of soybean production in the tropics. Seed quality is lowered if the soybean seed is subjected to a rainy period and high temperatures just before harvest. In addition, traditional storage practices for corn, wheat, sorghum, and cotton seed do not work for soybeans. Soybean seed germination declines rapidly when stored unprotected in the warm, humid conditions of the tropics. The low and uncertain germination rate lowers yields because farmers will have difficulty achieving optimum population, a key to getting high yields. If the germination rate is lower than expected, the stand will be too thin and weed growth will reduce yields. If the germination rate is higher than expected, the stand will be too thick, and the plants will grow so tall that they lodge (fall over) easily, again reducing yields.

Where there is no winter season, high germination is difficult without storage facilities to keep seeds dry and cool. Traditional, farm-level storage will not protect seed soybeans adequately in the tropics. Because many developing countries lack the capital to construct such facilities, the high-quality seed needed if soybean production is to expand is not available.

Even if much improved varieties and good seed are made available, farmers will not be quick to expand production until processing facilities can be developed. Investors will not construct modern processing facilities when an area might have only a few thousand hectares of soybeans. A small solvent extraction plant may cost \$20 million to build and require more than 200 tons of soybeans a day to be economical (6). This is much more than is grown in many developing countries. If the crop yield was one ton and the plant operated 300 days a year, then 60,000 hectares would be required. However, even 200 tons is small by modern industry standards. To achieve economies of size, U.S. plants process 1,200 to 2,000 tons per day.

Because of the small scale of soybean production in most countries of the tropics, village-level hydraulic extraction technology costing from \$5,000 to \$50,000 is more practical (7). Small-scale facilities for producing soy milk and textured vegetable protein are also used. Low-cost equipment opens up soybean processing to small-scale entrepreneurs to develop markets for soybean oil and protein-enriched foods. This is a key step to gaining consumer acceptance where soybean foods are new and incomes are not yet high enough to afford meat and poultry products to improve protein-deficient diets.

Soybeans Have Long Been An Important Food in the Orient

Soybeans are an important protein source for more than a billion people in East Asia. Their traditional soybean foods are made by water extraction or by fermentation.

Soy milk is made by soaking and grinding dehulled soybeans, cooking in water, and filtering off the insoluble residues. The remaining liquid has nearly the same analysis as cow's milk and is cheaper to produce. One kilogram of dehulled soybeans can make 5

kilograms of soy milk with a 5-percent protein content. Besides being a lower-cost protein food than dairy milk, soy milk is acceptable for people who are allergic to the lactose in cow's milk. This soy milk can be used to make soy ice cream, soy yogurt, and other dairy-like products. When calcium sulfate is added to soy milk, a curd, tofu, is produced.

Among the fermented products, soy sauce is common. It is made by fermenting rice with soybeans or soybean meal. Miso is another fermented product made by blending cooked soybeans with steamed rice and salt water. It becomes a paste that is used as a soupstock, as a spread on bread, and as a flavoring agent. Other popular fermented food products include natto and tempeh, both made from small, whole soybeans.

Despite the popularity of these soybean foods in the Orient, gaining consumer acceptance in other countries is slow. In some, low-income people have protein-deficient diets. The low cost of Western soybean food products makes them potential supplements in protein-deficient diets. In India, for example, the cost per kilogram of protein in milk and eggs was 12 and 15 times higher than in soybean flour (13).

Researchers are experimenting with various ways of using soybean products to supplement the protein of the traditional starch foods in low-income areas. In Cameroon, for example, researchers are using soybean flour to fortify "fufu," a popular cassava food with a protein content of only 2 percent (8). The addition of 10 percent soybean flour raises the protein content to 7 percent without changing the taste.

Three general types of soybean food products can be made from the seed after the oil is removed (14). Flours and grits are the least refined forms and sell at the lowest prices. These products are 40 to 50 percent protein. Protein concentrate is a more refined product, with a protein content of at least 70 percent. Concentrates sell at three to four times the prices for flours and grits. Protein isolates are the most refined. Their protein content is greater than 90 percent and they are eight to ten times more expensive than the flours.

Flours, concentrates, and isolates are powders. They can be made into textured forms with fibrous, chewy properties resembling meats. These textured products sell for 1.5 to 2 times the prices of the powdered forms.

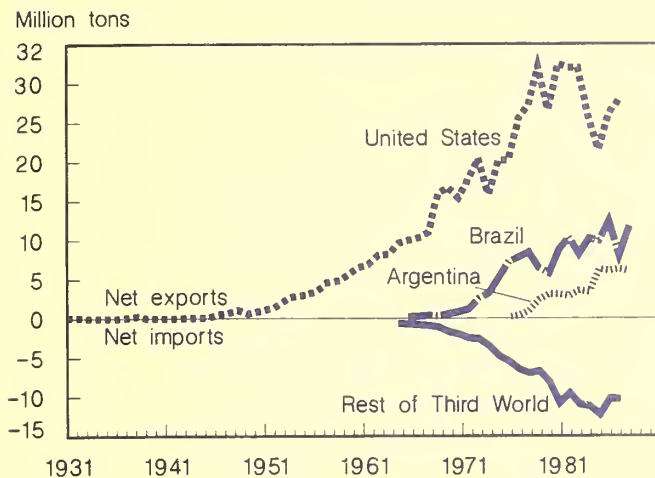
Expansion Will Continue If Prices Are High

Where soybeans have the potential to supplement protein-deficient diets of low-income people, it will be important to gain consumer acceptance for soybean and soybean-fortified foods. Research will be needed to develop suitable varieties and investments will have to be made in facilities for seed storage and rhizobia production and distribution. Investments in small-scale processing facilities will also be needed.

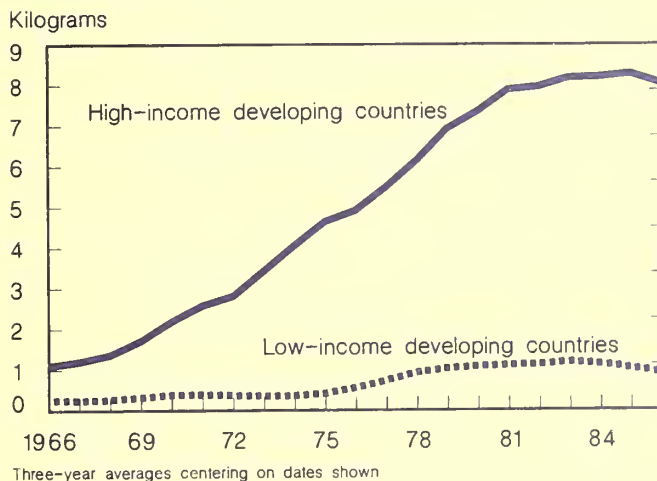
The major factors driving increased demand for imports of soybeans and soybean products in the Third World are rising incomes and population. Rising incomes raise consumer demand for meat and other food products such as margarine and cooking oil, in turn boosting the demand for meal and edible oils.

Fierce export competition with the South Americans for these markets, as well as the developed-country markets, will likely continue. The expansion of large-scale soybean production in South America will continue as long as soybean prices are high enough for Brazilian farmers to profitably open new lands for soybeans and the Brazilian Government to develop the rural transportation system connecting these lands to the ocean ports. If the price of soybeans is high relative to other crops, farmers in Brazil, Argentina, and elsewhere will find it profitable to switch even more of their existing cropland to soybeans.

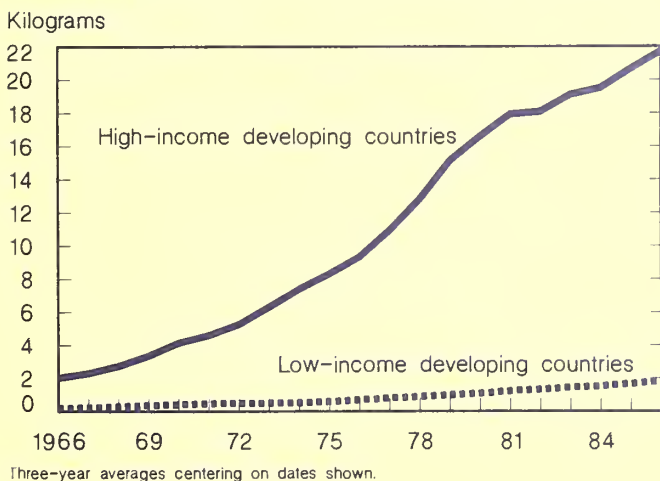
Soybean and Soybean Product Trade of the United States and the Third World



Per Capita Use of Soybean Oil



Per Capita Use of Soybean Meal as a Protein Supplement



References

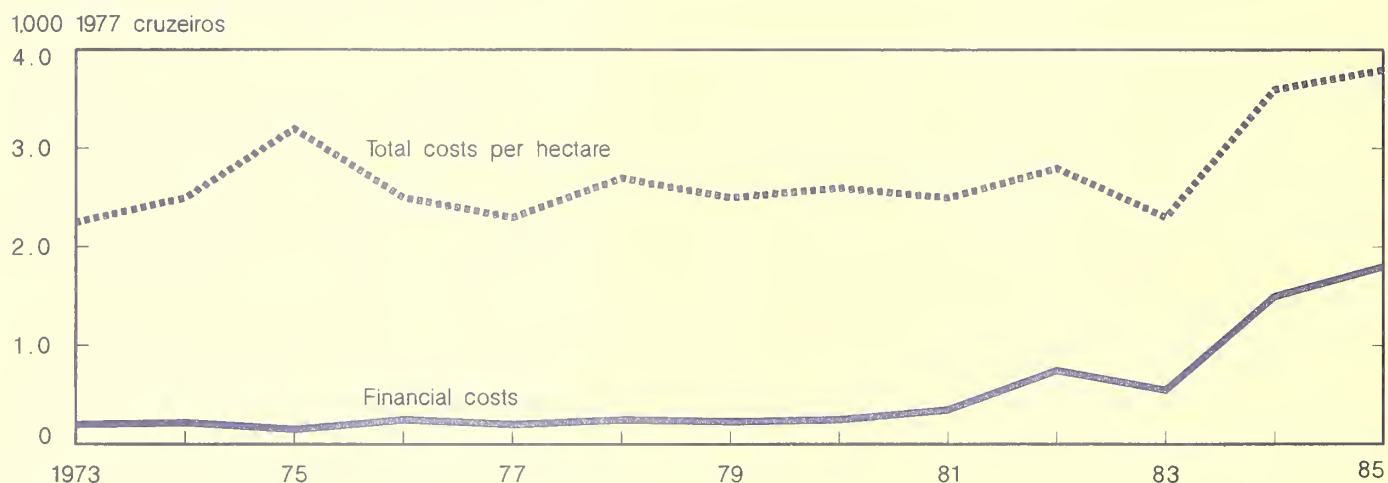
1. Baker, David H., and Robert A Easter. "Soy Protein as a Source of Amino Acids For Nonruminant Animals," in Lowell D. Hill (ed.), *World Soybean Research, Proceedings for the World Soybean Research Conference*. Danville, Illinois: 1976.
2. Ensminger, M.E., and C.G. Olentine, Jr. *Feeds and Nutrition- Complete*. Clovis, California: 1978.
3. Gabe, Howard. "The South American Connection In The International Soybean Market - A Breeder's Look Into The Future." *Proceedings of the Twelfth Soybean Seed Research Conference 1982*. Washington, DC: 1982.
4. Hartwig, Edgar E. "Growth and Reproductive Characteristics of Soybeans (*Glycine max* (L) Merr.) Grown Under Short-Day Conditions." *Tropical Science*, Vol. XII No. 1.
5. Hartwig, Edgar E. "Some Thoughts After Thirty Years of Soybean Research In the South." *Soybean News*, January 1984.
6. Hillman, Jimmie S., and Merle D. Faminow. "Brazilian Soybeans: Agribusiness 'Miracle'." *Agribusiness*, Vol. 3, No. 1 (1987).
7. INTSOY. *INTSOY Newsletter*, No. 35.
8. Kueneman, E.A., and Nathan Russell. "Soybean Utilization: Its Relevance to Africa's Food Crisis." *Ceres*, No. 104 (Vol. 18, No.2) (March-April, 1985).
9. Loewy, Richard A. "The Expanding World Demand For U.S. Soybean Meal." *1982 Commodity Year Book*. New York: 1982.
10. Ruff, Samuel O. "Brazil Plans to Increase Sales Via Export Corridors Program." *Foreign Agriculture*, Vol. XI, No. 42 (Oct. 8, 1973).
11. U.S. Department of Agriculture data.
12. U.S. International Trade Commission. *U.S. Global Competitiveness: Oilseeds and Oilseed Products*. USITC 2045. Washington, DC: December 1987.
13. Williams, S.W. "Economics of Food Utilization of Soybeans in Low Income Areas," in Lowell D. Hill (ed.), *World Soybean Research, Proceedings of the World Soybean Research Conference*. Danville, Illinois, 1976.
14. Wolf, W.J. "Present Status of Edible Soybean Protein Products in the United States." *Proceedings of the Second U.S.-China Soybean Symposium*, May 1984.

BRAZILIAN SOYBEAN PRODUCERS' COSTS OF PRODUCTION TURN UP

From 1978 through 1983, the real value of production credit provided by Brazil's national rural credit system to soybean producers varied annually, with no apparent trend, between 120 and 170 billion 1981 cruzeiros. In 1984 and 1985, however, production credit availability dropped markedly. The variability in the amount of credit provided can be attributed to changes in Brazil's credit policy in response to changing monetary and financial conditions. [David L. Peacock (202) 786-1700]

At the same time as credit availability dropped, effective interest rates paid by Brazilian soybean producers rose sharply. The following figure shows how one researcher estimates the effect of these two factors on Brazilian soybean producers' costs of production between 1973 and 1985. [Ed.]

Brazilian Soybean Producers' Costs



Source: Vincent Leclercq, "Conditions et Limites de l'Insertion du Brésil dans le Marché International du Soja" ("Conditions and Limits of Brazil's Entry into the World Soybean Market"), unpublished Ph.D. dissertation, Paris/IEDES, May 1987.

U.S. SOYBEAN EXPORTS: COMPETITORS AND MARKETS

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Abstract: U.S. soybeans are not only the major commodity contributing to the value of U.S. agricultural exports, but over the past decade they have constituted 79 percent of the world's soybean exports. Argentina and Brazil together exported 15 percent. Brazil led world soybean meal exports with 36 percent, followed by 29 percent from the United States and 20 percent from the EC-10. The EC-10 and Japan have been the leading markets for U.S. soybeans, taking 40 and 20 percent of U.S. exports. The EC-10 took 50 percent of U.S. soybean meal exports, while Canada and Venezuela each bought about 7.5 percent.

Keywords: Soybeans, exports, soybean meal, markets, market shares, exporters.

Soybeans and their products have contributed more to the value of U.S. agricultural exports during the past decade than any other single commodity, exceeding second-place corn and products and third-place wheat and products (figure 1). About 75 percent of the soybean contribution to U.S. exports comes from soybeans, 20 percent from oilcake and meal, and the remaining 5 percent from soybean oil. More than 72 percent of the world's soybean exports in 1986/87 came from the United States.

This article examines the international setting for soybean and meal exports over the past 10 years, focusing on competing exporters and major U.S. markets. Major competitors and markets for U.S. soybeans and soybean meal are identified. U.S. and competitor

shares of world markets, and some particular U.S. markets, are presented. Understanding trends and policies within these major competitors and markets provides the context for understanding opportunities and limits for future U.S. soybean and soybean meal exports.

U.S. Share of Soybean Exports Fluctuates

For the 10 marketing years 1977/78 through 1986/87, the U.S. share of world soybean exports averaged over 79 percent. Other significant exporters included Argentina, Brazil, and China (figure 2).

The U.S. share was highest during 1981/82 and 1982/83, around 86 percent, because of a drop in soybean exports from Argentina and Brazil. During those 2 years, U.S. production and exports were the largest for any consecutive 2-year period before or since. At the same time, Argentina's soybean exports were dampened by internal policies. Argentine and Brazilian shares of the soybean export market peaked in 1984/85, at 11.9 and 13.9 percent, respectively, when U.S. exports dropped and the U.S. share fell to its low of 65 percent.

Brazil, the world's third largest soybean exporter over the past decade, averaged over 6 percent of world soybean exports. However, during 1981/82 and 1982/83, Brazil's soybean exports claimed less than 4 percent of the world market.

Figure 1
Soybeans' Contribution to U.S. Export Value

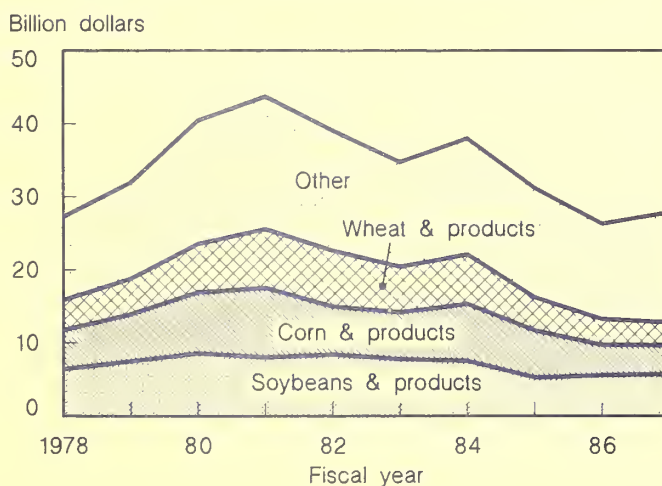
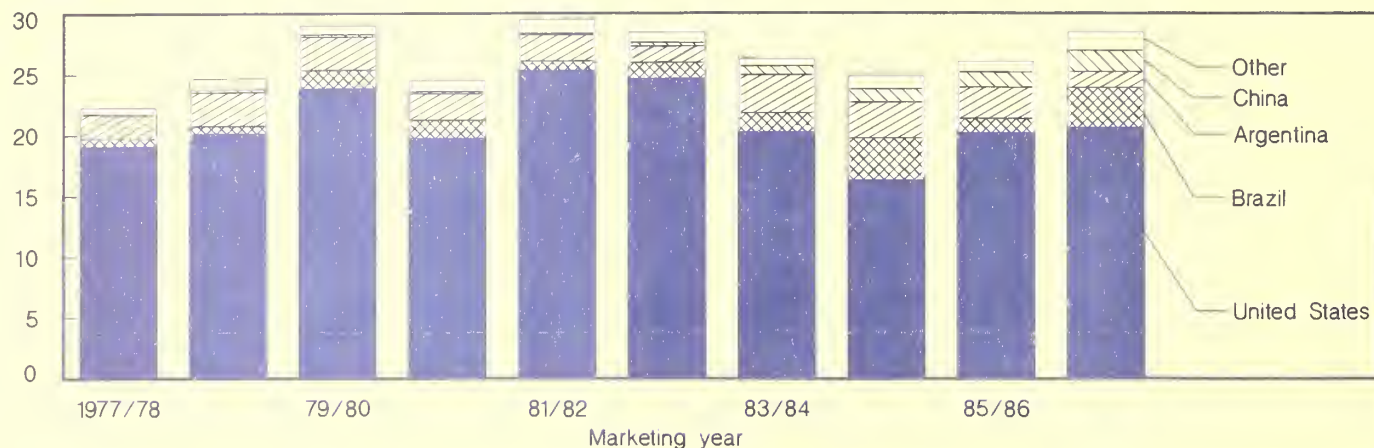


Figure 2
World Soybean Exports

Million metric tons



During 1984/85, when the U.S. dollar was strongest against currencies of soybean importers and competing exporters, the U.S. share of the world market fell to 65 percent, the lowest in 10 years. For the last 2 years, the dollar's declining value has again made U.S. soybeans more attractive to foreign buyers, and the U.S. market share has averaged 75 percent. The shares of Argentina and Brazil averaged 7 and 8 percent, respectively, during these 2 years.

Argentina's soybean exports generally have grown rapidly since 1975/76, reflecting increased production. Brazil has also expanded production and exports over the past decade, but exports a larger portion of its crop as meal than either the United States or Argentina.

Although China's share of world soybean exports is small, it has grown from less than 1 percent in 1977/78 to 6 percent in 1986/87, reflecting increased production. China now exports over 1 million tons of soybeans annually, and has also expanded its crushing capacity.

Export shares of the world soybean market reflect not only soybean production within those countries, but also government policies that affect soybean production and trade.

Soybeans: Government Role Varies

Government agricultural policy influences soybean exports in Argentina and Brazil, as

well as in the United States. An Economic Research Service study of Government intervention in agriculture during 1981/82-83/84 found that U.S. soybean producers received no direct income support and relatively light assistance through Commodity Credit Corporation (CCC) loan activities, credit subsidies, and crop insurance (4). 1/ In Argentina and Brazil, soybean exports were taxed at higher rates than soybean meal and soybean oil exports to generate revenue and to encourage soybean sales to the domestic crushing industry.

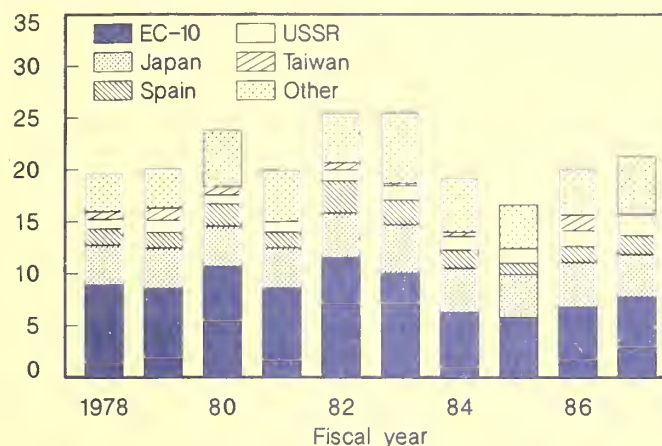
During the 1980's, taxes and Government intervention in the Brazilian market likely reduced the growth in soybean production, domestic supply, and exports. Growth in area and production in the late 1970's and 1980's was much slower than in the late 1960's and early 1970's (5). Domestic processors and crushers have benefited from these policies, whose net effect on Brazilian producers has been mixed.

The ERS study found that among soybean importers, the EC, Japan, and South Korea encouraged soybean production through deficiency payments or support prices. Soybean producers were also subsidized in Taiwan and Mexico. Comparing Japan, Taiwan, and South Korea, consumers of soybeans were taxed the least in Japan and the

1/ Numbers in parentheses refer to References at end.

Figure 3
U.S. Soybean Exports by Markets

Million metric tons



most in South Korea (4). All five of these countries are important markets for U.S. soybeans.

Top U.S. Soybean Markets: EC and Japan

The EC-10 and Japan have consistently been the largest markets for U.S. soybeans over the last 10 fiscal years, taking an average 40.3 and 19.5 percent, respectively, of U.S. exports (figure 3). However, the EC share fell from 45.4 percent in 1978 to less than 33 percent in 1984, as EC oilseed production rose, particularly rapeseed and sunflowerseed. Despite minor fluctuations, Japan's share of the U.S. market has been stable, as has Spain's with an 8.7-percent share. However, the

combined shares of Taiwan, South Korea, and Portugal grew from 7 percent in 1978 to over 17 percent in 1987.

From calendar 1978 through 1985, the United States supplied all the soybean imports for Japan, Taiwan, and South Korea, and at least three-quarters of the soybeans to the EC-10, Spain, Mexico, and Portugal.

Although Soviet soybean imports generally have fluctuated, imports of U.S. soybeans have varied even more widely. In fiscal 1979, the USSR took almost 6 percent or nearly 1.2 million metric tons of U.S. soybean exports. That figure dropped to zero after the U.S. sales suspension over Soviet involvement in Afghanistan. Subsequently, the USSR imported 1.5 million tons of U.S. soybeans in 1986, but less than 71,000 metric tons in 1987.

Fluctuations in foreign markets, such as the USSR, are neither new nor unique, and are experienced not only by the United States, but also by Argentina and Brazil.

Market Shares Fluctuate

During calendar 1980-1983, the U.S. share of EC-10 soybean imports was boosted as South American soybean exports to the EC-10 were diminished (table 1). This rise occurred, in part, because Argentina's soybean exports declined from 1979 through 1983. Also, from 1980 through 1983, Argentina exported an average of nearly 700,000 tons a year to the

Table 1--Exporter shares of EC-10 soybean imports

Exporter	1978	1979	1980	1981	1982	1983	1984	1985	1986
1,000 metric tons									
United States	9,007	9,186	9,651	8,970	10,771	9,428	6,402	5,883	7,200
Argentina	1,380	1,991	1,207	573	522	610	2,032	1,640	1,472
Brazil	363	368	498	172	56	299	670	2,214	808
Other	451	589	716	780	870	641	390	465	429
Total	11,201	12,134	12,072	10,495	12,219	10,978	9,494	10,202	9,909
Percent									
United States	81	76	80	86	88	85	68	57	73
Argentina	12	16	10	5	4	6	21	16	15
Brazil	3	3	4	2	--	3	7	22	8
Other	4	5	6	7	7	6	4	5	4
Total	100	100	100	100	100	100	100	100	100

-- = Less than 0.5 percent.

Source: Import data reported to the United Nations.

Table 2---Exporter shares of USSR soybean imports

Exporter	1978	1979	1980	1981	1982	1983	1984	1985	1986
1,000 metric tons									
United States	843	1,697	317	32	649	491	137	0	1,558
Argentina	0	0	667	758	594	747	149	454	0
Brazil	30	68	101	558	263	128	0	0	0
Other	0	0	0	48	0	0	329	385	454
Total	873	1,765	1,085	1,396	1,506	1,366	615	839	2,012
Percent									
United States	97	96	29	2	43	36	22	0	77
Argentina	0	0	62	54	40	55	24	54	0
Brazil	3	4	9	40	17	9	0	0	0
Other	0	0	0	4	0	0	54	46	23
Total	100	100	100	100	100	100	100	100	100

Source: Import data reported to the United Nations.

USSR, which had never before purchased Argentine soybeans (table 2). Finally, from 1980 through 1983, combined Argentine and Brazilian soybean exports to the USSR exceeded those from the United States, a change from the previous 3 years. The effects of these trends were similar on the U.S. share of Spain's soybean imports.

In contrast to U.S. dominance of the EC-10 soybean market, the U.S. share of the USSR market ranged from 97 percent in 1978 to zero in 1985. Argentina and Brazil were the other principal suppliers until 1984, when China became a major source of soybeans for the USSR.

Argentine soybean shipments to the USSR were part of an agreement signed in 1980, which called for annual deliveries of 500,000 tons from 1980 through 1985 (2). In January 1986, the agreement was extended through 1990. Brazil had also signed an agreement in the early 1980's, under which 2.5 million metric tons of soybeans, 2 million tons of soybean meal, and 200,000 tons of soybean oil were to be exported to the USSR from 1982 through 1986. This agreement has not been extended. (Terms of the original Argentine and Brazilian agreements have not always been met.) China is committed to providing 2.6 million tons of soybeans to the USSR during 1986-90. Bilateral agreements, particularly when they are honored, become effective influences on trade. However, basic economic factors also affect a country's soybean exports.

Income and Price Affect U.S. Soybean Exports

A recent econometric analysis of imports of U.S. soybeans by major markets identified income in importing countries and the U.S. price as major factors affecting purchases of U.S. soybeans (3). Demand for U.S. soybeans was estimated to be strongly influenced by changes in income, which reflected demand for livestock products and feed inputs in Mexico as well as in Taiwan. Income grew significantly over the 1965-83 estimation period and demand was highly income elastic. (The income elasticity of U.S. exports is the percentage change in exports resulting from a 1-percent change in income in the importing country. Demand is said to be income-elastic if the percentage change in exports exceeds the percentage change in income, to be unitary-elastic if the percentage changes are equal, and to be inelastic if the percentage change in exports is less than the percentage change in income.)

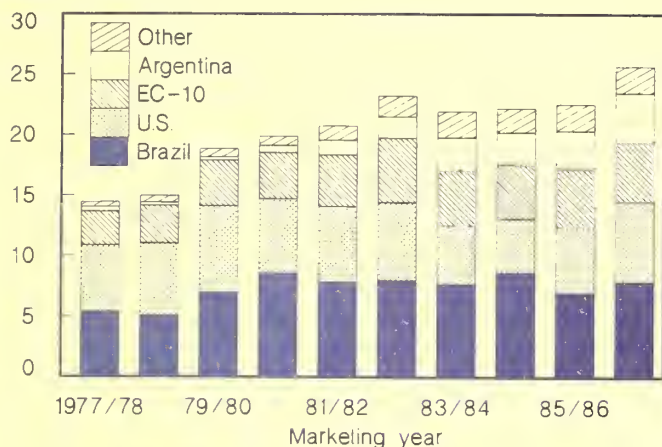
Demand was less affected by income (income-inelastic) for the EC and Japan, both high-income regions, as protein use in animal feed rations reached optimal levels. Future increases of U.S. soybean exports to those regions will likely be due to factors other than rising incomes there. In the EC, use of other domestically-produced oilseeds and meals is replacing soybean and soybean meal imports.

The U.S. soybean price was identified as the second most influential factor affecting

Figure 4

World Soybean Meal Exports by Exporter

Million metric tons



exports of U.S. soybeans. Response to price was estimated elastic in Spain, indicating a high degree of price sensitivity for the limited amount of U.S. soybeans imported. On the other hand, the inelastic price response estimated for Japan and Taiwan may reflect the use of policies that have contributed to greater internal price stability.

U.S. Lags Brazil in Soybean Meal Exports

In world soybean meal exports, Brazil led with 35 percent during marketing years 1977/78–1986/87, followed by the United States with 29 percent, the EC-10 with 20 percent, and Argentina with 8 percent. Brazil's share of the soybean meal market ranged from 43 percent in 1980/81 to 31 in 1986/87, while Argentina's rose from 3 to 15 percent during that period (figure 4).

In both Brazil and Argentina, oil and meal exports are taxed at lower rates than soybean exports, encouraging domestic crushing and the exporting of meal and oil over soybeans (1). Brazil's soybean crush rose nearly tenfold during the 1970's, reaching 13 million tons by 1980, a level more or less maintained since then. Until 1975, Brazil exported roughly equal amounts of soybeans and soybean meal (5). The proportion of meal exports increased in the late 1970's and, since 1980, tonnage of meal exports has been five to six times that of soybeans. Argentina's soybean meal exports, like Brazil's, have continually increased as soybean production has risen. Lower world wheat prices led to cuts in Argentine wheat

area in 1986 and boosted expansion of soybean area, which led to increased output and exports of soybeans and meal.

The U.S. share of soybean meal exports has varied, from 40 percent in 1978/79 to 20 percent in 1984/85. Rising exports from Argentina and Brazil, plus the strong dollar, pushed the U.S. volume and share to its low in 1984/85.

Although the volume of EC-10 soybean meal exports rose nearly 80 percent over the past decade, the EC share of the world soybean meal market began and ended the 10-year period at 19 percent. While the EC-10 is a major soybean meal export competitor, it must import the soybeans to crush, which indirectly benefits U.S. soybean exports since the EC-10 is the major U.S. soybean market. However, Italy, the major EC soybean producer, is expanding soybean output.

EC Took Half of U.S. Soybean Meal

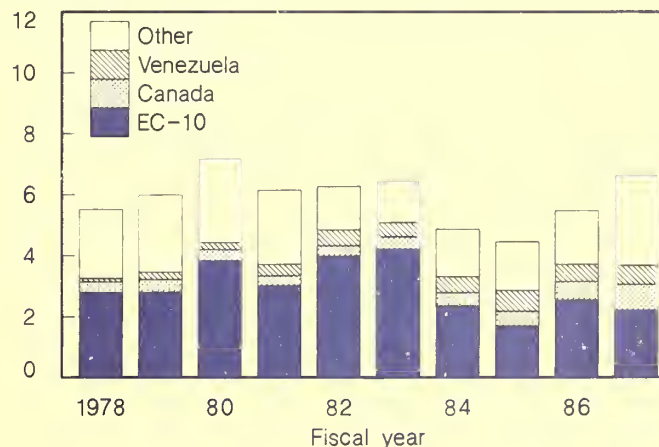
From fiscal 1978 through 1987, the EC-10 was consistently the largest market for U.S. soybean meal, taking 50 percent (figure 5). Canada and Venezuela each bought about 7.5 percent. The other 35 percent was divided among the Philippines, Mexico, Iraq, Eastern European countries, and others.

Since 1983, the EC portion of U.S. soybean meal exports has generally declined, from 65 percent to 33 percent in 1987, while Canada's percentage has doubled from 6 to

Figure 5

U.S. Soybean Meal Exports by Markets

Million metric tons



over 12 percent. Venezuela's share has also increased, but more modestly, from 7 to 9 percent. The other minor markets have doubled their percentage, from 21 to 45 percent.

U.S. and Competitors' Exports To Rise

Although soybean production is trending upward in Argentina and Brazil, policies within these two major U.S. competitors continue to favor exports of soybean meal and soybean oil over soybeans. If China were to step up its shipments to the USSR, then U.S., Argentine, and Brazilian market shares could erode (2). Soybean imports by the EC-10, the largest U.S. customer, may diminish in the future as EC production of rapeseed, sunflower seed, and soybeans expands.

Rising soybean meal exports by Brazil and Argentina may boost their shares of the soybean meal export market, cutting into the U.S. share. As the demand for, and production of, livestock products expands around the world, the demand for soybean meal should continue to grow, assuring an expanding market for soybean meal from the United States and competing exporters.

References

1. Allen, Edward, and Jorge Hazera. "South American Soybean and Product Exporters." *Western Hemisphere Situation and Outlook Report*. USDA-ERS, July 1987, pp. 41-43.
2. Bickerton, Thomas W. *USSR Oilseed Production, Processing, and Trade*, FAER-232. USDA-ERS, Sept. 1987, p. 18.
3. Davison, Cecil, and Carlos Arnade. *Export Demand for U.S. Corn and Soybeans*. ERS Staff Report No. AGES870723. USDA, Aug. 1987, p. 17.
4. Economic Research Service, U.S. Department of Agriculture. *Government Intervention in Agriculture: Measurement, Evaluation, and Implications for Trade Negotiations*, FAER-229. April 1987, pp. 29-30.
5. Peacock, David L., and Edward Allen. "Producer Subsidy Equivalent Calculations: Brazilian Soybeans." *Western Hemisphere Situation and Outlook Report*. USDA-ERS, July 1987, pp. 31-38.

UNITED STATES BENEFITS FROM SOVIET STRATEGY TO INCREASE SOYBEAN IMPORTS

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Abstract: Renewed emphasis on improving the composition of the Soviet consumer's diet and the efficiency of the Soviet livestock sector likely contributed to the Soviets' near-record feed protein imports in 1987 and the large import program likely for 1988. These factors apparently overshadowed the hard currency constraint and competing needs for imported Western capital goods. Improved political relations with the United States, increased U.S. competitiveness due to the decline in the value of the dollar, and the possibility of spreading the delivery of purchases from the United States over a longer period to facilitate domestic handling may be helping to increase the U.S. share of the expanding Soviet market.

Keywords: Soybeans, oilseeds, Soviet agricultural production, Soviet agricultural trade.

The Soviets wish to improve quickly and substantially the per capita availability of livestock products. They wish to provide an incentive to workers to commit themselves to the Gorbachev reforms and a clear sign of the success of the reforms. Soviet per capita meat consumption is currently about half U.S. consumption.

Hampering development of the Soviet livestock sector is its chronic protein shortage in animal feeds, estimated by the Soviets at around 10 million tons in soybean meal equivalent. Soviet animal productivity is one-half to two-thirds that in Western Europe and the United States. Western and Soviet analysts concur that improving animal rations—including raising the protein content of feeds—is an obvious way to substantially raise animal productivity, improve feeding efficiency (including that for the large quantities of imported grain), and increase animal product output in the USSR.

Soviet plans, announced in the mid-1980's, to overcome the domestic protein shortage by 1990 have remained unfulfilled. Those plans called for significantly greater production of high protein feeds including oilseeds, pulses, and single-cell proteins, and a shift in roughage production from grasses to alfalfa and clovers. Total Soviet oilseed production has been about 10.3–11.1 million

tons in recent years and consists of sunflowerseed, cottonseed and, to a lesser extent, flaxseed and rapeseed. In the 1980's production of sunflowerseed, the major Soviet oilseed crop, has averaged below the 1976–80 level of 5.3 million tons a year and has been less than called for by plans (table 1).

Although Soviet attempts to increase soybean and rapeseed production finally showed modest success in 1986, the crops combined accounted for less than 1 million tons that year. Moreover, production continues to fall well below planned levels. Livestock inventories, on the other hand, have increased about 10 percent from 1976 to 1980.

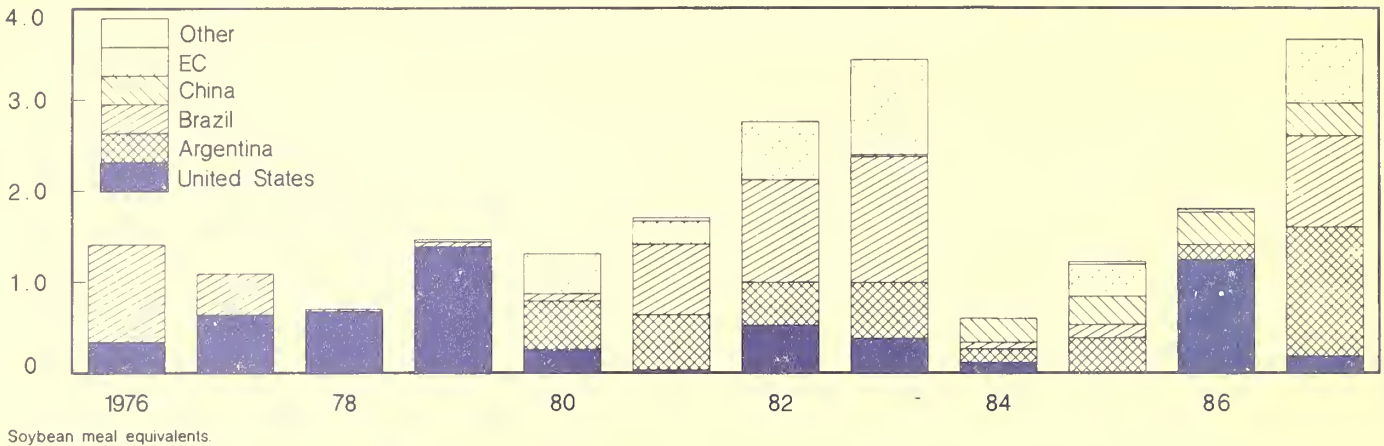
The Soviets began large imports of protein feeds in the second half of the 1970's in an effort to bolster the livestock sector (figure 1). (Soybeans and soybean meal account for almost all of feed protein imports.) After a sharp and difficult-to-explain drop in calendar 1984, they renewed imports in 1985. Imports in 1987 may have topped 1983's record 3.4 million tons (in meal equivalent) despite the hard currency constraint that developed in 1986 and continues to keep total Soviet imports from the West below the 1981–85 average of \$19 billion (figure 2).

The Soviet turn to the United States in 1988 is not explained by supply problems in

Figure 1

USSR Soybean and Soybean Meal Imports

Million tons



competitor countries. The soybean crops in Brazil and Argentina are expected to be a record in 1988, and China's soybean crop is also expected to be good in 1988. Furthermore, EC soybean stocks available for crush are large.

From September through February, the USSR purchased a record 1.3 million tons of U.S. soybean meal and 813,000 tons of U.S. soybeans, primarily for shipment during 1987/88. The United States, which had not sold soybean meal to the Soviet Union since 1979, increased its share of the Soviet soybean meal market to nearly 5 percent in 1987 and may account for about 40 percent in 1988. Likewise, the U.S. share of Soviet soybean imports may rise from almost 10 percent in 1987 to about 50 percent in 1988.

Pricing, shipping, and political factors appear to account for at least part of the improvement in U.S.-Soviet soybean and meal trade. The fall in the value of the U.S. dollar may be one element aiding U.S. sales. Secondly, the improved U.S.-USSR political climate, which has already extended to the agricultural area with U.S. offers and USSR acceptance of wheat under the Export Enhancement Program (EEP), could be contributing to increased purchases. While nearly all the meal that the Soviets import from Argentina and Brazil is in pelletized form, U.S. meal exports generally are not pelletized.

Figure 2

USSR Trade with Developed West

Billion rubles

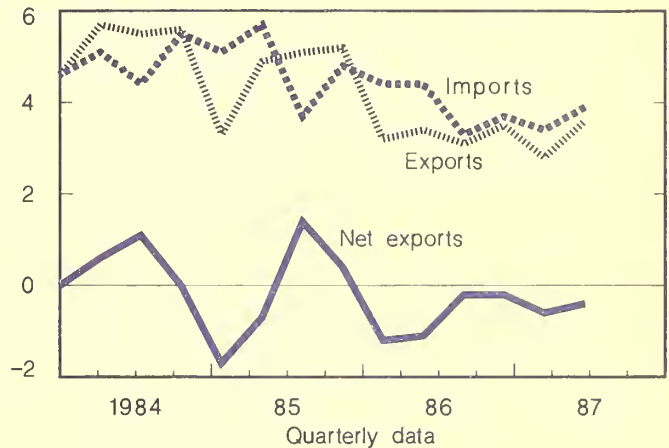


Table 1--USSR: Selected oilseeds statistics

	1976-80 average	1981-85 average	1985	1986	1987 1/	1987 Plan 2/	1990 Plan
Sunflowerseed							
Area (million ha)	4.471	4.142	4.053	3.941	4.100	NA	NA
Yield (tons/ha)	1.19	1.20	1.29	1.34	1.49	NA	NA
Production (million tons)	5.309	4.969	5.234	5.280	6.100	6.100	7.400
Rapeseed							
Area (million ha)	.015	.107	.123	.161	.600	NA	NA
Yield (tons/ha)	.93	.51	.60	.89	.67	NA	NA
Production (million tons)	.014	.055	.074	.144	.400	.690	1.500
Soybeans							
Area (million ha)	.811	.818	.738	.741	.775		
Yield (tons/ha)	.65	.61	.62	.79	.80		
Production (million tons)	.529	.503	.458	.589	.620	.814	1.000

1/ USDA February forecast. 2/ *Maslichnye kultury*, No. 3 (1987), p. 30.

Sources: *Vestnik statistiki*, various issues; *Maslichnye kultury*, various issues.

Figure 3

USSR Soybean Imports

Million tons

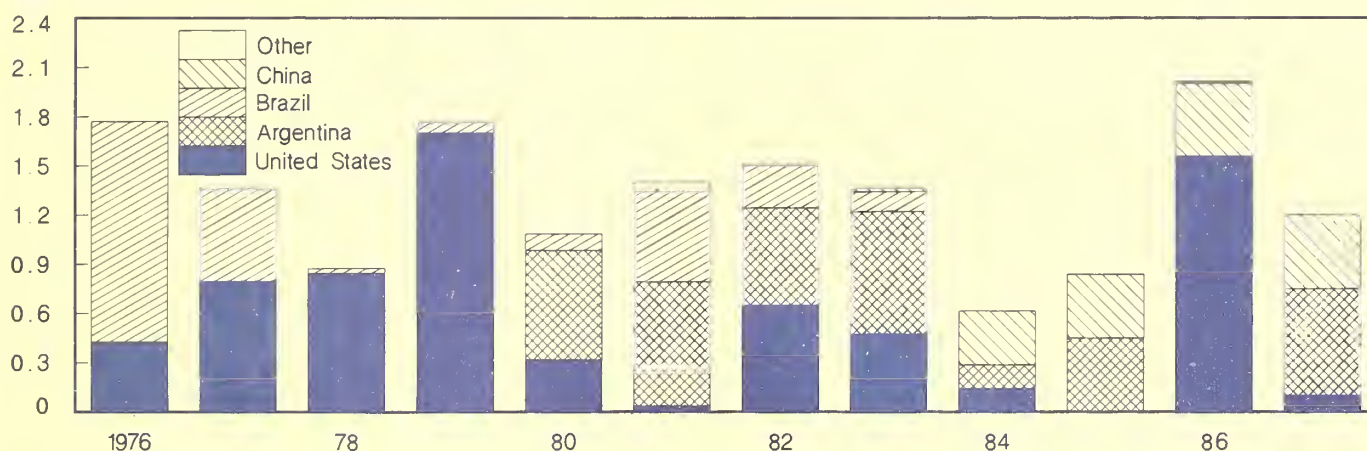
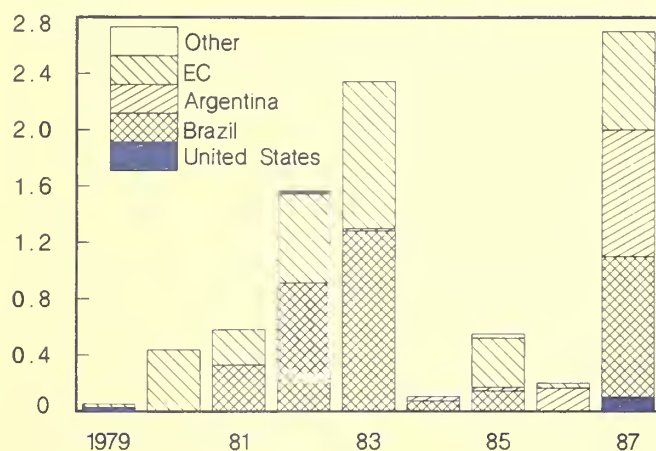


Figure 4

USSR Soybean Meal Imports

Million tons



THE IMPACT OF ECONOMIC DEVELOPMENT ON GLOBAL FOOD DEMAND PATTERNS

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Abstract: This article analyzes global food demand for coarse grains, wheat and rice, and meat. The mix of these commodities demanded at various income levels appears to change in a predictable manner as economic development proceeds. This analysis anticipates the direction and the magnitude of these changes in demand.

Keywords: Food demand, economic development, income, consumption patterns.

The study of global wheat and rice demand is important to the future of U.S. trade, since the United States is the largest wheat exporter and the second largest rice exporter in the world. Understanding the demand for meat provides insight into future demand for feed grains, of which the United States is a leading exporter.

The Data

The analysis uses food consumption quantities derived from the food balance data tapes of the Food and Agriculture Organization (FAO) of the United Nations for the period 1966-80 for 105 countries. To permit direct comparison among, and aggregation of, the food groups in the study, the edible primary and secondary products were converted to calories and expressed as a percentage of total calories consumed per capita per day. This measure is referred to as "percentage of total diet." 1/

Estimates of per capita gross domestic product adjusted for purchasing power parity in constant 1975 international dollars are used to measure economic development. 2/ The

study refers to this variable as "per capita income."

The Analysis

It is often assumed in economic literature that demand for food is a simple declining linear function of income. In this study, it is hypothesized that as income increases, a food group will change in consumers' preference from a preferred item to a necessity, and finally to a less preferred item. If this hypothesis is correct, food demand is not a constant declining linear function, but a more complicated function that changes in a nonlinear manner as income increases. Further, the nature of the function is not expected to be identical for the three food groups in the study.

With economic development, demand for the least preferred foods is expected to fall in a nonlinear manner. Graphic analysis of coarse grain data suggests that this food group is an economically inferior commodity group at all levels of income (figure 1). Apparently, coarse grains are never considered a luxury item, or even a necessity, as incomes increase.

Wheat and rice data show two distinct patterns (figures 2 through 4). A group of 80 countries clearly forms a pattern that follows the hypothesis stated above. The 25 countries in the second group consume a much larger proportion of their diet as wheat/rice than countries in the first group. Many of these countries subsidize production or consumption of either wheat or rice, causing consumption

1/ For full details of the study, see Suzanne Marie Marks and Mervin J. Yetley, *Global Food Demand Patterns Over Changing Levels of Economic Development*, ERS Staff Report No. AGES870910, October 1987.

2/ Further mention of per capita income will refer to constant 1975 international dollars.

**Figure 1--Coarse Grain Consumption 1/
(Scatter Graph of 105 Countries)**



1/ The apparent zero values are a scale problem on the plot, not actual zero levels of consumption1

**Figure 2--Wheat and Rice Consumption
(Scatter Graph of 105 Countries)**



**Figure 3--Wheat and Rice Consumption
(Scatter Graph of 80 Countries)**



to be artificially higher than it normally would be.

For the 80 countries, it appears that wheat/rice is considered a preferred good at low income levels, then becomes a necessary good as coarse grain consumption is reduced. Finally, wheat/rice becomes an inferior good as income levels permit meat to be substituted into the diet.

**Figure 4--Wheat and Rice Consumption
(Scatter Graph of 25 Countries)**



Meat consumption is assumed to follow a pattern similar to wheat and rice (figure 5). Thus, meat may be considered a preferred good in the low-income range, where increasing demand would be expected. Then, at some income level the rate of increase in consumption decreases. Possible decreases in absolute meat consumption are foreseeable as the variety of foods in the diet increases.

Figure 5--Meat Consumption
(Scatter Graph of 105 Countries)



The estimated functions and statistical results of the equations for each of the three food groups show that as income increases: the percentage of coarse grains in the diet decreases; the percentage of wheat/rice in the diet increases, then decreases; and the percentage of meat in the diet increases until very high income levels are reached, then decreases.

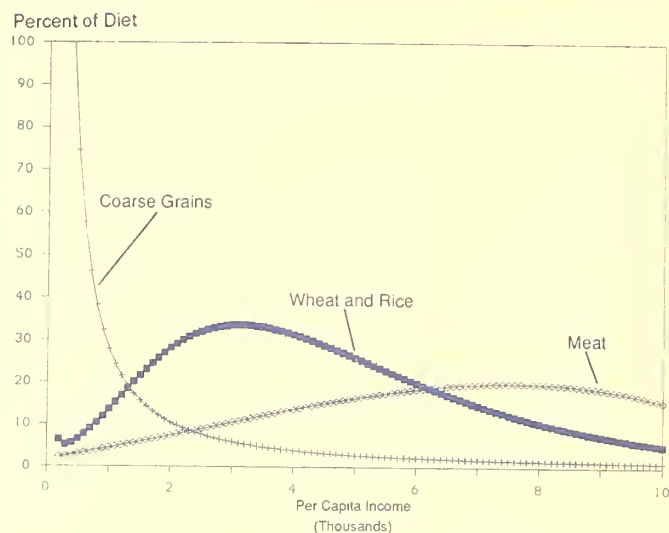
Implications

The findings show significant variations in the percentages of coarse grains, wheat/rice, and meat in the diet with changing per capita income. The estimated food demand functions enable anticipation of the direction and magnitude of variations in the diet over the observed income range.

When these variations are plotted together over the income range, as in figure 6, we can make some general observations about the tendency of these food groups to substitute for or complement each other. At low income levels, coarse grains account for a large proportion of the diet. But as incomes rise, the percentage of coarse grains in the diet decreases rapidly and is overtaken by wheat and rice. As incomes reach higher levels, the proportion of meat in the diet exceeds that of wheat and rice.

Thus, without calculating cross-price elasticities of demand (the percentage change in demand for a food in response to changes in

Figure 6--Food Consumption/Percentage of Diet for Wheat and Rice, Meat, and Coarse Grains



its own price and in those of substitute or complementary foods), and allowing for differences in food preferences among countries, it appears that wheat and rice generally substitute for coarse grains at lower income levels. Then, at higher incomes, meat substitutes for wheat and rice in the diet. From approximately \$300 to \$3,100, consumption of meat products and wheat and rice complement each other.

Income ranges can be identified with particular food patterns. Developing countries in the lower income ranges modify their food commodity mix as incomes increase by replacing traditional foods in the diet, such as coarse grains, with wheat and rice. Thus, demand pattern adjustments occur among the staple commodity groups. For countries in the lowest income range, meat is not in the effective field of choice. In these countries, consumers are still too poor to effectively demand more than the cheapest of food commodities. But, as per capita incomes rise past \$300, meat enters the effective field of choice and complements wheat and rice.

As countries pass through the middle ranges of income, wheat and rice consumption peaks and then decreases. Substitution of meat for grains takes place. The rise in meat demand continues until high levels of income are attained. Meat consumption as a percentage of the diet surpasses wheat and rice consumption at approximately \$6,200 in the high-income range representing developed

market economies. However, the share of meat in the diet tends to reach a saturation point, and even declines at extremely high income levels.

Although this study does not focus on the projection of food demand patterns for a specific country, it seems reasonable to expect individual countries to follow the global patterns exhibited in figure 6. Unless special climatic or cultural factors cause departure from these patterns, we may expect most deviations to be transitory in nature.

As incomes increase and dietary demands change, the potential for trade increases since it is often cheaper to import than to produce domestically. Trade potential will be driven by demand in the middle- and upper-income developing countries, especially by the derived demand for feed. Import growth will likely occur in the upper-income developing countries due to their greater purchasing capacity. U.S. agriculture, as the leading exporter of both food and feed grains, could benefit from increased volume of trade with these countries.

COUNTRY BRIEFS

Four NIC's Graduate from GSP

On January 2, 1989, four newly industrialized countries (NIC's)--South Korea, Taiwan, Hong Kong, and Singapore--will be removed from the Generalized Schedule of Preferences (GSP), the program under which the United States grants developing countries duty-free treatment on certain products to aid in their economic development. The countries will be given the same status as industrialized nations. These are the first countries to lose GSP eligibility before reaching the usual cutoff level of \$8,500 per capita GNP. The action was prompted by the growing U.S. trade deficit with NIC's, whose prosperity is due in large part to their expanding U.S. trade.

Although the U.S. action affects nearly US\$10 billion in imports, little impact is expected. Tariffs imposed on these countries' exports will average only about 5 percent. Many NIC exporters can easily adjust by cutting profit margins or improving production efficiency. Withdrawing GSP privileges from all four at the same time means that their relative competitiveness will remain unchanged. For producers of low-value-added items (e.g., toys and accessories), GSP beneficiaries in Latin America, such as Mexico and Brazil, could improve their competitive position in the United States vis-a-vis the NIC's. But the NIC's, in general, have moved into higher value-added areas where few other GSP countries have the infrastructure or the expertise to displace them even with preferential tariff treatment.

Since withdrawing GSP will have only a minimal effect on their economies, the impact on U.S. agricultural exports to the NIC's will likewise be limited. The NIC's represent a large agricultural market because of their growing middle-income population and scarce land resources. The market is primarily for bulk commodity imports to support livestock, flour milling, and export-oriented industries such as textile and leather goods manufacturing. Prospects are good for increased U.S. farm sales to NIC's. Expanding livestock inventories in these countries will ensure strong demand for coarse grain and soybeans. Consumption of wheat, almost all imported, has increased steadily because of changing eating habits and growing population. Imports of high-value products will continue to grow because of rapid economic expansion in the region. [Sophia Huang (202) 786-1613]

Credit Programs Boost U.S. Agricultural Exports to Yemen

Efforts since 1985 to increase agricultural exports to the Yemen Arab Republic (YAR), bolstered by extending various credit programs, including GSM-102, GSM 103, and PL-480 Title I, and the Export Enhancement Program (EEP), have contributed to increasing U.S. agricultural exports to this market to over \$53 million in 1987, compared with \$30 million in 1986, and \$15 million in 1985.

In 1987, food grains and animal feeds accounted for almost all U.S. exports to the YAR. Dried lentils, prepared vegetables, and seeds made up the remainder. Wheat exports

rose to 176,301 tons compared with 111,757 tons in 1986. The average value was \$103 per ton, compared with an average of \$113 per ton in 1986. Similarly, wheat flour shipments rose to 123,777 tons compared with 75,663 tons, valued at \$115 per ton compared with \$149 last year. U.S. rice exports rose to 30,028 tons valued at \$229 per ton, compared with 23,909 tons with an average value of \$208 per ton in 1986. Under the EEP, U.S. firms sold 104,419 tons of mixed poultry feed valued at \$130 per ton. This occurred in the face of keen competition, especially from Dutch firms which have been active in the YAR market for several years.

Yemen's imports include wheat, flour, rice, corn, feedstuffs, sugar, meat, and dairy products, with wheat and flour by far the most important. Imports of wheat and flour in 1987 were nearly 880,000 tons (in equivalent wheat

terms), or about 93 percent of the country's consumption requirements. Based on an econometric model, YAR import demand for wheat and flour by 1991 is forecast at between 1.1 and 1.2 million tons. The European Community (EC) is the largest agricultural exporter to the YAR. During 1984-86, the EC market share averaged about 30 percent of Yemen's agricultural imports, while the U.S. share was below 9 percent. Australia has traditionally been the largest wheat exporter to Yemen. [Fawzi A. Taha (202) 786-1680]

USSR Lowers Cuban Sugar Price

The Soviet Union has cut the price it pays for Cuban sugar from 45 cents a pound to 36 cents, according to observers of the Cuban economy. The Soviet Union buys about 5.5 million tons of sugar annually from Cuba. [The New York Times, March 16]

Outlook '88 Proceedings and Charts

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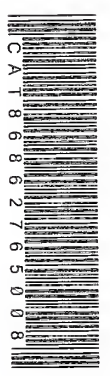
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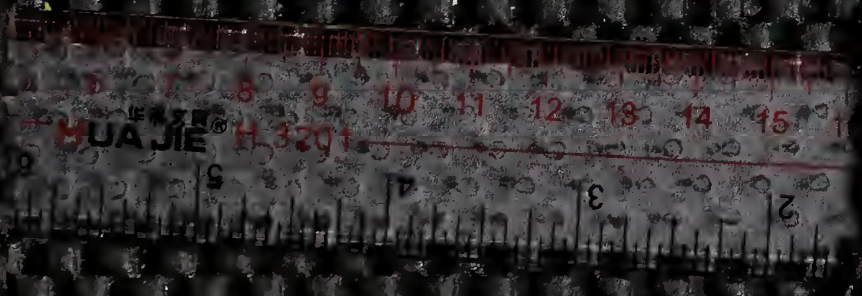
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